

This listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently amended) An energy efficient pump apparatus, comprising:

a first closed conduit having a first and a second end;

a first movable piston ~~[[with]]~~ having a closed end having an effective length A greater than a median radius of ~~[[said]]~~ the first closed conduit, ~~[[said]]~~ the first movable piston being loosely disposed within ~~[[said]]~~ the first closed conduit such that a first gap having a predefined median size is formed between ~~[[said]]~~ the first movable piston and ~~[[said]]~~ the first closed conduit~~[[;]],and~~

a flexible drive member connected to a top end of the first movable piston and operable to move the first movable piston up and down along the first closed conduit,

(i) wherein ~~[[said]]~~ the first movable piston is movable in ~~[[said]]~~ the first closed conduit at a velocity relative to ~~[[said]]~~ the first closed conduit such that as ~~[[said]]~~ the first movable piston moves along ~~[[said]]~~ the first closed conduit, ~~[[said]]~~ the first movable piston creates a substantially tortuous leak path forming a hydrodynamic seal between ~~[[said]]~~ the first movable piston and ~~[[said]]~~ the first closed conduit, thereby enabling ~~[[said]]~~ the first movable piston to displace fluid along ~~[[said]]~~ the first closed conduit~~[[;]], and~~

(ii) an efficiency of ~~[[said]]~~ the hydrodynamic seal is based on ~~[[said]]~~ the predefined median size of ~~[[said]]~~ the first gap, ~~[[said]]~~ the effective length A of ~~[[said]]~~ the first movable piston, and ~~[[said]]~~ the velocity of ~~[[said]]~~ the first movable piston.

2. (Currently amended) The pump apparatus of claim 1 wherein ~~[[said]]~~ the first movable piston further comprises ~~includes~~ a one-way valve disposed therein, and the first movable piston and the first closed conduit are arranged such that when ~~[[said]]~~ the first movable piston is moved back

and forth along ~~[[said]]~~ the first closed conduit, ~~[[said]]~~ the first movable piston pulls and pumps fluid along ~~[[said]]~~ the first closed conduit.

3. (Currently amended) The pump apparatus of claim 2 wherein ~~[[said]]~~ the first closed conduit is positioned at an angle other than horizontal, ~~and said the first closed conduit further comprises~~ includes a one-way inlet valve at a lower portion thereof, and the first movable piston and the first closed conduit are arranged such that when ~~[[said]]~~ the first movable piston is moved up and down along ~~[[said]]~~ the first closed conduit, fluid is pulled into and pumped up ~~[[said]]~~ the first closed conduit.

Claims 4-5. (Cancelled)

6. (Currently amended) The pump apparatus of claim ~~[[5]]~~ 1 further comprising a pipe having a top end and a bottom end, wherein (i) ~~[[said]]~~ the bottom end of ~~[[said]]~~ the pipe is attached to ~~[[said]]~~ the top end of ~~[[said]]~~ the first closed conduit, (ii) during an up-stroke of ~~[[said]]~~ the pump apparatus, ~~[[said]]~~ the first movable piston is pulled up by ~~[[said]]~~ the flexible drive member, and (iii) during a down-stroke of ~~[[said]]~~ the pump apparatus, ~~[[said]]~~ the first movable piston is pulled down by gravity, thereby pulling and pumping fluid into and up ~~[[said]]~~ the pipe.

7. (Currently amended) The pump apparatus of claim 6 further comprising:

a second closed conduit having a top end and a bottom end, and including an outlet disposed at a lower end of the second closed conduit; and

a second movable piston loosely disposed within ~~[[said]]~~ the second closed conduit such that a second gap having a predefined median size is formed between ~~[[said]]~~ the second movable piston and ~~[[said]]~~ the second closed conduit, ~~[[said]]~~ the second movable piston including a rigid drive member~~[[;]]~~,

wherein ~~[[said]]~~ the bottom end of ~~[[said]]~~ the second closed conduit is attached to ~~[[said]]~~ the top end of ~~[[said]]~~ the pipe~~[[;]]~~, and

during operation of [[said]] the pump apparatus [[said]] the first and second movable pistons move in [[said]] the respective first and second closed conduits to facilitate fluid flow into [[said]] the first closed conduit, such that the fluid flows into and up [[said]] the pipe on the up-stroke, and out of [[said]] the outlet under pressure on the down-stroke.

8. (Currently amended) The pump apparatus of claim 7 further comprising an outlet pipe connected to the outlet at the lower end of [[said]] the second closed conduit and a one-way outlet valve disposed in [[said]] the outlet pipe to limit the amount of force required to move [[said]] the first and second movable pistons on the up-stroke.

9. (Currently amended) The pump apparatus of claim 7 further comprising:

a closed sleeve outlet conduit comprising a closed sleeve and an outlet pipe connected to an upper portion of [[said]] the closed sleeve, [[said]] the closed sleeve outlet conduit covering [[said]] the second closed conduit and creating a second gap between an outer wall of [[said]] the second closed conduit and an inner wall of [[said]] the closed sleeve, such that [[said]] the second gap is sealed both at a bottom and a top of [[said]] the closed sleeve outlet conduit, and such that substantially any fluid flowing through [[said]] the outlet at the lower end of [[said]] the second closed conduit flows into [[said]] the second gap,

wherein during operation of [[said]] the pump apparatus [[said]] the first and second movable pistons move in [[said]] the respective first and second closed conduits to facilitate fluid flow into (i) [[said]] the first closed conduit, into and up [[said]] the pipe and into [[said]] the second closed conduit during the up-stroke, and (ii) through [[said]] the opening of [[said]] the second closed conduit, into [[said]] the sleeve-conduit gap and out of [[said]] the outlet pipe under pressure during the down-stroke.

10. (Currently amended) The pump apparatus of claim 9 wherein [[said]] the sleeve outlet pipe includes a one-way valve disposed therein to limit the amount of force required to move [[said]] the first and second movable pistons on the up-stroke.

Claims 11–31. (Cancelled)